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- (71) Applicant (for all designated States except US): **SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.** [NL/NL]; Carel van Bylandtlaan 30, NL-2596 HR The Hague (NL).
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- (72) Inventors; and
- (75) Inventors/Applicants (*for US only*): **BROK, Theodorus, Johannes** [NL/NL]; Badhuisweg 3,, NL-1031 CM Amsterdam (NL). **GROENEN, Rudolf, Johannes, Mathilda** [NL/NL]; Badhuisweg 3,, NL-1031 CM Amsterdam (NL). **KLINKENBIJL, Jeanine, Marie** [NL/NL]; Badhuisweg 3,, NL-1031 CM Amsterdam (NL). **KNAAP, Mariette, Catharine** [NL/NL]; Badhuisweg 3,, NL-1031 CM Amsterdam (NL).

(54) Title: PROCESS FOR REMOVING CARBON DIOXIDE FROM GAS MIXTURES

(57) Abstract: The present invention relates to a process for removing carbon dioxide and optionally hydrogen sulphide and/or COS from a gas stream containing these compounds by washing the gas with an aqueous washing solution containing water, sulfolane and a secondary or tertiary amine derived from ethanolamine. More particularly the invention relates to the process described above, the process being carried out in the presence of a primary or secondary amine compound in an amount between 0.5 and 15 wt. % based on water, sulfolane and amine. The invention further relates to an absorbent liquid to be used in the above process.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B01D53/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 00 66249 A (UNION CARBIDE CHEMICALS & PLASTICS TECHNOLOGY CORPORATION) 9 November 2000 (2000-11-09)	1-4, 6-13, 15, 16
Y	page 1, line 5 -page 4, line 25; claims 1-7	14
Y	--- US 5 820 837 A (MARJANOVICH ET AL) 13 October 1998 (1998-10-13) column 3, line 65 -column 6, line 11	14
Y	--- US 6 102 987 A (GROSS ET AL) 15 August 2000 (2000-08-15) column 4, line 38 -column 5, line 52	14
A	--- US 4 336 233 A (APPL ET AL) 22 June 1982 (1982-06-22) cited in the application column 1, line 10 -column 3, line 44	1
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☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Doolan, G

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>GB 2 017 524 A (SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B. V.) 10 October 1979 (1979-10-10) examples 1,2</p> <p>-----</p>	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 03/00338

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0066249	A	09-11-2000	US 6337059 B1 AU 4681600 A CA 2371778 A1 CN 1349427 T EP 1177030 A1 NO 20015363 A WO 0066249 A1	08-01-2002 17-11-2000 09-11-2000 15-05-2002 06-02-2002 29-11-2001 09-11-2000
US 5820837	A	13-10-1998	CA 2177449 A1	21-11-1997
US 6102987	A	15-08-2000	DE 19753903 A1 CN 1218711 A DE 59804040 D1 EP 0920901 A2 NO 985702 A	24-06-1999 09-06-1999 13-06-2002 09-06-1999 07-06-1999
US 4336233	A	22-06-1982	DE 2551717 A1 AT 365942 B AT 854176 A BE 848483 A1 CA 1090098 A1 CS 219323 B2 ES 453391 A1 FR 2332049 A1 GB 1560905 A JP 1355979 C JP 52063171 A JP 61019286 B NL 7612855 A ,B,	02-06-1977 25-02-1982 15-07-1981 18-05-1977 25-11-1980 25-03-1983 16-03-1978 17-06-1977 13-02-1980 24-12-1986 25-05-1977 16-05-1986 23-05-1977
GB 2017524	A	10-10-1979	NL 7803075 A AU 524870 B2 AU 4526179 A BE 874786 A2 BR 7901719 A CA 1127379 A1 DE 2910940 A1 FR 2422432 A1 JP 54131570 A MX 6342 E MY 91585 A ZA 7901327 A	25-09-1979 07-10-1982 27-09-1979 13-09-1979 16-10-1979 13-07-1982 11-10-1979 09-11-1979 12-10-1979 23-04-1985 31-12-1985 26-03-1980